

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : HITACHI LTD

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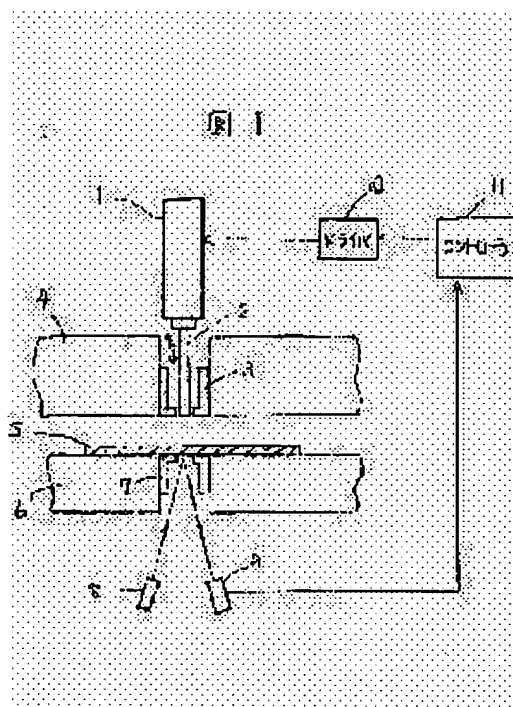
(72)Inventor : ICHINOSE TOSHIKI

## (54) PUNCHING DEVICE

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a punching device minimizing the number of defective products in punching of a ceramic green sheet by immediately deciding a punching defect and raising an alarm.

SOLUTION: This punching device has a sensor detecting reflected light below a punching die and a mechanism deciding simultaneously with the punching from reflected light intensity whether normal punching is executed or not.



## LEGAL STATUS

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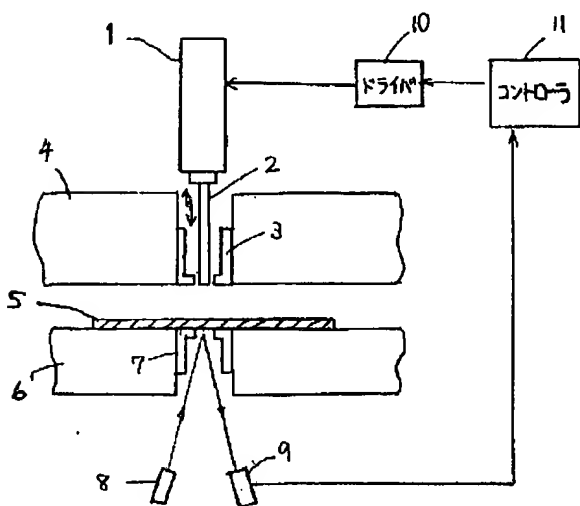
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## DRAWINGS

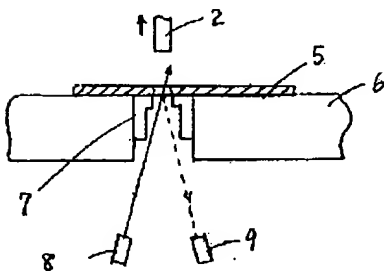
[Drawing 1]

図 1



[Drawing 2]

図 2



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hole dawn processing equipment of the ceramic green sheet for forming especially a ceramic multilayer substrate about the equipment which carries out hole dawn processing to a sheet-like substrate.

[0002]

[Description of the Prior Art] hole dawn processing equipment which is indicated by JP,2-84304,A as equipment which carries out hole dawn processing to a sheet-like substrate, for example -- it is -- conventional hole dawn processing equipment -- electromagnetism -- it was what a punch pin is dropped with the driving force of a coil etc., and carries out hole dawn of a green sheet. Usually, in order to perform two or more hole dawns to a green sheet, after dropping a punch pin and carrying out hole dawn, a punch pin is raised, pitch delivery of the green sheet is carried out, and two or more through hole hole dawn processings are performed. In this case, by wear of a punch pin etc., the defect with whom it kept remaining in the pin point, and dregs peel and stop being able to fall from the pin point easily, and are got blocked in the hole of a green sheet at the time of a rise of a punch pin, and the defect whom a punch pin breaks and a hole does not open may occur. For this reason, the activity which checks whether it is drilling injury normal about a sheet by viewing etc. was required after hole dawn processing.

[0003]

[Problem(s) to be Solved by the Invention] However, by the approach of checking visually etc. after hole dawn processing, when many tens of thousands of holes were also made in the sheet of one sheet, there was a problem from which all the sheets that for the important point reason carried out hole dawn processing of the long duration while checking become a defect in checking that all holes are normally open.

[0004]

[Means for Solving the Problem] In order to solve the above-mentioned trouble, this invention checks that the drilling injury has been carried out normally to hole dawn processing and coincidence by irradiating light from a sheet lower part to the hole dawn section at the time of a punch pin rise of a hole dawn processing machine, detecting the reflected light, and having a means to judge whether the hole is normally open with the reinforcement of the reflected light.

[0005]

[Embodiment of the Invention] The example of this invention is shown in drawing 1. An actuator 1 drives the punch pin 2 up and down, and the punch pin 2 is guided with the punch pin guide 3 supported by the punch 4. An actuator 1 is driven by the basis of a command of a controller 11, and the driver 10. Moreover, female mold 6 supports the die 7 for hole dawn processing. If the bore diameter of a die 7 is larger than the outer diameter of the punch pin 2 and the punch pin 2 descends, the tip of the punch pin 2 will be inserted in the hole of a die 7, and the shearing work of the green sheet 5 will be carried out in this case. The sensor 9 which catches the light source 8 and the reflected light under the die 7 is formed.

The light source irradiates a green sheet 5 through the hole of a die 7. The reflected light from a green sheet 5 is caught by the sensor 9.

[0006] In the above configuration, in order to carry out hole dawn processing of the green sheet 5, a controller 11 issues first the command to which the punch pin 2 is dropped. Next, the command which raises the punch pin 2 is issued and the output of a sensor 9 is investigated to the timing to which the punch pin 2 went up. As shown in drawing 2, when a hole penetrates normally, in order that the light of the light source 8 may pass through the through hole of a green sheet 5, the reflected light from this part hardly returns. Therefore, the output value of the reflected light reinforcement of the reflected light caught by the sensor 9 becomes small. On the other hand, when the hole has not penetrated normally, compared with always [ forward ], the output value of reflected light reinforcement becomes large.

[0007] A controller 11 investigates this reflected light reinforcement using a suitable threshold, and it judges whether the hole is normally open.

[0008]

[Effect of the Invention] Since it can judge whether the drilling injury was able to be carried out normally to hole dawn and coincidence according to this invention, when a defect occurs, an alarm can be emitted immediately and the number of defective generating can be made into min.

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CLAIMS

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[Claim(s)]

[Claim 1] Hole dawn equipment characterized by to judge whether light is irradiated from a sheet lower part to the hole dawn section at the time of a punch pin rise, the reflected light is detected in the equipment which it descends, and the punch pin guided to the sheet-like substrate in the punch pin guide hole is raised, and ends a hole, and the hole is normally open with the reinforcement of this reflected light.

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